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09/830,030	04/20/2001	Yukihito Ichikawa	WATK:211	9377

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EXAMINER	
TRAN, HIEN THI	
ART UNIT	**PAPER NUMBER**
1764	

DATE MAILED: 01/27/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/830,030	ICHIKAWA ET AL.	
	Examiner	Art Unit	
	Hien Tran	1764	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 November 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4-32,34 and 36* is/are pending in the application.

4a) Of the above claim(s) *12-15,19-32 and 34* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4-11,16-18 and 36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *1,4-32,34 and 36* are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 April 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☒ Other: *translation of JP 61-068141*.

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "58" (page 58, line 20) and "59" (page 60, line 14) have both been used to designate the "fuel". Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

2. The drawings have not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the drawings to comply with CFR 1.84(p)(5), e.g. they should include the reference sign(s) mentioned in the specification and vice versa.

Specification

3. The disclosure is objected to because of the following informalities:

On page 39, lines 8-22 it is unclear as to what applicants are attempting to recite, which 14 cells, or 10 cells or 4 cells are implied.

On page 60, line 14 "59" should moved to after "components" if that is what is implied. However, applicants should check Figs. 23 and 26 to see if the reference numerals "58, 59" are matching with the elements illustrated therein.

Appropriate correction is required.

4. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 8, 36 are rejected under 35 U.S.C. 102(b) as being anticipated by JP 05-123580.

JP 05-123580 discloses an undulated-wall honeycomb structure having a plurality of cell passages defining a cell passage direction, which are mutually parallel in the cell passage direction; wherein intersection portions between walls defining said cell passages have a predetermined pitch in cross-sections perpendicular to said cell passages and are located in a pattern and wherein the wall face portions of said walls excluding said intersection portions have an undulated shape in both the cell passage direction and the cross-sectional direction perpendicular to said cell passage direction (see, for example, abstract, Figs. 1-3); wherein the wall face portions including portions having an undulated shape and flat shape (see, for example, section 0022, Figs. 2a, 2b).

Instant claims 8, 36 structurally read on the apparatus of JP 05-123580.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

9. Claims 1, 6-7, 9-10, 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 05-123580 in view of Gulati (4,323,614).

With respect to claims 1, 7, JP 05-123580 discloses an undulated-wall honeycomb structure having a plurality of cell passages defining a cell passage direction, which are mutually parallel in the cell passage direction; wherein intersection portions between walls defining said cell passages have a predetermined pitch in cross-sections perpendicular to said cell passages and are located in a pattern and wherein the wall face portions of said walls excluding said intersection portions have an undulated shape in both the cell passage direction and the cross-sectional direction perpendicular to said cell passage direction (see, for example, abstract, Figs. 1-3).

The apparatus of JP 05-123580 is substantially the same as that of the instant claims, but is silent as to whether the protrusions of each wall face portion face one another and the recessions of each face one another as claimed.

However, Gulati discloses provision of having cell passages with the protrusions of each wall face portion facing one another and the recessions of each facing one another.

It would have been obvious to one having ordinary skill in the art to construct the apparatus of JP 05-123580 so as to have the protrusions of each wall face portion facing one another and the recessions of each facing one another as taught by Gulati, on the basis of its suitability for the intended use as a matter of obvious design choice, and the shape of the cell passages is not considered to confer patentability to the claim and since such a modification would have involved a mere change in the shape of a component. A change in shape is generally recognized as being within the level of ordinary skill in the art, absence showing any unexpected results. *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

With respect to claim 6, JP 05-123580 shows that the amplitude of the undulated wall appears to be at least 150% the thickness of the wall (see, for example, Figs. 1-2).

With respect to claim 9, JP 05-123580 discloses that the honeycomb structure has a center portion surrounded by an outer portion, the center portion comprising cell passages defined by undulated wall face portions; the outer portion comprising cell passages defined by flat wall face portions, the thickness of the wall 3 of the cell passages at the outer portion is greater than that of the wall 4 of the cell passages at the center portion (see, for example, sections 0019, 0021).

With respect to claim 10, JP 05-123580 discloses that the honeycomb structure is made from activated carbon (see, for example, section 0032).

With respect to claim 16, JP 05-123580 discloses that the honeycomb structure has an undulated surface for increasing the surface area, and carries a catalyst on the surface thereof for purifying exhaust gas. Placing the honeycomb structure in a housing is inherent therein. (see, for example, abstract, section 0001).

10. Claims 1, 4, 7, 10, 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 61-68141 in view of Gulati (4,323,614).

With respect to claims 1, 4, 7, JP 61-68141 discloses an undulated-wall honeycomb structure having a plurality of cell passages defining a cell passage direction, which are mutually parallel in the cell passage direction; wherein intersection portions between walls defining said cell passages have a predetermined pitch in cross-sections perpendicular to said cell passages and are located in a pattern and wherein the wall face portions of said walls excluding said intersection portions have an undulated shape in both the cell passage direction and the cross-sectional direction perpendicular to said cell passage direction (see, for example, abstract, Figs. 2, 4).

The same teaching/comments with respect to Gulati apply.

With respect to claim 10, JP 61-68141 discloses that the undulated-wall honeycomb structure made of ceramic material, such cordierite, aluminum titanate, etc. (see, for example, translation page 4).

With respect to claim 16, JP 61-68141 discloses that the honeycomb structure has an undulated surface for increasing the surface area, and carries a catalyst on the surface thereof for purifying exhaust gas. Placing the honeycomb structure in a housing is inherent therein.

11. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP 61-68141 in view of Gulati (4,323,614) as applied to claims 1, 4, 7, 10, 16 above and further in view of GB 2,071,640 and Maus et al (WO 96/12876 corresponding to US 6,274,099).

The modified apparatus of JP 61-68141 is substantially the same as that of the instant claim, but fails to teach whether the deformation is greater at the outer portion that at the center portion.

GB '640 discloses provision of a honeycomb structure having the channels in the outer region clogged for improving the thermal insulation.

Maus et al discloses provision of a honeycomb structure having deformation at the outer region to close channels in the peripheral region for improving the thermal insulation.

It would have been obvious to one having ordinary skill in the art to construct the modified honeycomb structure of JP 61-68141 so as the deformation at the outer region is greater than that at the center region so as to improve the thermal insulation of the structure as taught by GB '640 and Maus et al.

12. Claims 6, 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 61-68141 in view of Gulati (4,323,614) as applied to claims 1, 4, 7, 10, 16 above and further in view of in view of JP 10-059784.

With respect to claim 6, the modified honeycomb structure of JP 61-68141 is substantially the same as that of the instant claims, but is silent as to the specific amplitude of the undulated walls.

However, JP 10-059784 shows provision of an undulated-wall honeycomb structure having a plurality of cell passages wherein the wall face portions of said walls of said cell passages have an undulated shape, the amplitude of the undulated wall appears to be at least 150% the thickness of the wall (see, for example, Fig. 1).

It would have been obvious to one having ordinary skill in the art to select an appropriate amplitude for the undulated walls, such as the one taught by JP 10-059784 in the modified apparatus of JP 61-68141, to obtain the desired purification thereof on the basis of its suitability for the intended use as a matter of obvious design choice, and since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (*In re Aller*, 105 USPQ 233).

With respect to claim 18, the modified honeycomb structure of JP 61-68141 is substantially the same as that of the instant claims, but is silent as to the specific cell density.

However, JP 10-059784 shows provision of an undulated-wall honeycomb structure having a plurality of cell passages wherein the cell density is normally 280 cpsi (see, for example, abstract).

It would have been obvious to one having ordinary skill in the art to select an appropriate cell density for the honeycomb structure, such as the one taught by JP 10-059784 in the modified apparatus of JP 61-68141, to obtain the desired purification thereof on the basis of its suitability for the intended use as a matter of obvious design choice, and since it has been held that where

the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (*In re Aller*, 105 USPQ 233).

13. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable JP 05-123580 in view of Gulati (4,323,614) as applied to claims 1, 6-7, 9-10, 16 above and further in view of JP 10-059784.

The same comments with respect to JP 10-059784 apply.

14. Claims 11, 17 are rejected under 35 U.S.C. 103(a) as being unpatentable either (JP 05-123580 in view of Gulati (4,323,614)) or (JP 61-68141 in view of Gulati (4,323,614) and JP 10-059784) as applied to claims 10, 16 above and further in view of Abe et al (5,459,119).

The modified apparatus of either JP 05-123580 or JP 61-68141 as modified by JP 10-059784 is substantially the same as that of the instant claims, but is silent as to the specific wall thickness and porosity.

However, Abe et al discloses the conventionality of providing a honeycomb structure having the wall thickness and porosity as claimed in the instant claims.

The specific wall thickness and porosity of the honeycomb structure are not considered to confer patentability to the claim. The precise wall thickness and porosity of the honeycomb structure would have been considered a result effective variable by one having ordinary skill in the art. As such, without more, the claimed wall thickness and porosity of the honeycomb structure cannot be considered "critical". Accordingly, one having ordinary skill in the art would have routinely optimized the wall thickness and porosity of the honeycomb structure to obtain the desired purification thereof as evidenced by Abe et al (*In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980)), and since it has been held that where the general conditions of a claim

are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (*In re Aller*, 105 USPQ 233).

Response to Arguments

15. Applicant's arguments with respect to claims 1, 4-11, 16-18, 36 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hien Tran whose telephone number is (571) 272-1454. The examiner can normally be reached on Tuesday-Friday from 7:30AM-6:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hien Tran

Hien Tran
Primary Examiner
Art Unit 1764

HT

PTO: 2005-1954

Japanese Published Unexamined (Kokai) Patent Publication No. S61-68141; Publication Date: April 8, 1986; Application No. S59-190192; Application Date: September 11, 1984; Int. Cl.[4]: B01J 35/04 B01D 53/36 B28B 3/20 11/00 F01N 3/28; Inventor: Kozo Omura; Applicant: Toyota Motor Corporation; Japanese Title: Haikigasu Jouka-you Monorisu Shokybai Tantai oyobi Sono Seizou Houhou (Monolithic Catalyst Carrier for Purifying Exhaust Gas and Method for Producing the Same)

Specification

1. Title of Invention

Monolithic Catalyst Carrier for Purifying Exhaust Gas and Method for Producing the Same

2. Claim(s)

1. A monolithic catalyst carrier for purifying an exhaust gas, characterized in that wall surfaces of cells are in the form of waves.

2. A method for producing the monolithic catalyst carrier for purifying the exhaust gas, characterized in that at the production of the monolithic catalyst, a raw material of the monolithic catalyst carrier is extruded and process so that the plane of the monolithic carrier is formed into a wave shape.

3. Detailed Description of the Invention

[Field of Industrial Application]

This invention pertains to a monolithic catalyst for a gas contact oxidation reaction. In particular, this invention relates to a monolithic catalyst carrier for purifying an exhaust gas of an automobile vehicle.

[Prior Art]

The monolithic catalyst is mainly used for a catalytic oxidation reaction for an automobile exhaust gas and differs from prior art catalysts that are used for chemical devices as it is a monolithic honeycomb catalyst made of a low expansion rate ceramic, carrying platinum based main active component, which endures in a wide range of temperatures, is constantly highly active even in the change in the concentration of the reaction components, copes with poisoning by a lubricant, does not generate any sintering, and which has high mechanical strength, high heat impact resistance and high durability.

The production process for prior art monolithic catalyst carrier is as follow.

First, a raw material is kneaded. Secondly, a pressure is exerted to the kneaded raw material to extrude it into a monolithic form via dies. The monolithic article is then dried. Finally, a final product is completed via a sintering process.

As shown in Fig.2, the carrier of the monolithic catalyst for purifying a gas produced by using the producing method is in the form of the monolithic honeycomb. With respect to the structure, a cell wall 11 has a linear structure that does not have any bending areas from the inlet to the outlet of an exhaust gas. Due to the linear structure, when the gas runs, the loss of the pressure is extremely low in comparison with that of a pellet carrier. In turn, the surface area effective to a catalyst reaction is smaller at about

1/10 of that of the pellet carrier. As a result, a catalytic period of the exhaust gas with the catalyst surface is reduced so that the gas passes the catalyst while the catalytic reaction does not sufficiently take place.

[Purpose of the Invention]

The purpose of the invention is to offer a monolithic catalyst carrier for purifying an exhaust gas that is capable of performing a sufficient catalytic reaction by extending the contact period between the exhaust gas and the catalyst surface by giving a proper flow passage resistance at the same time when the catalytic area for circulating the gas within the monolithic catalyst carrier is expanded without changing the whole capacity of the catalyst in terms of elimination of the disadvantages, and to offer a producing method for the monolithic catalyst carrier.

[Brief Description of the Invention]

The present invention is to offer a monolithic catalyst carrier for purifying an exhaust gas, characterized in that wall surfaces of cells are in the form of waves.

The invention is also to offer a method for manufacturing the monolithic catalyst carrier for purifying the exhaust gas, characterized in that at the production of the monolithic catalyst, a raw material of the monolithic catalyst carrier is extruded and process so that the plane of the monolithic carrier is formed into a wave shape.

[Detailed Description of the Constitution of the Invention]

Fig.2 illustrates the outer appearance of prior art monolithic catalyst carrier. The cell walls intersect each other linearly and are wave-less planes. Fig.3 illustrates the outer appearance of the monolithic catalyst carrier being partially cut. In contrast, Fig.1 illustrates a monolithic catalyst carrier of the invention being partially cut. The difference between prior art carrier and the carrier of the invention is that the carrier of the invention has a wave on the cell walls.

Because of the wavy wall surfaces of the carrier cells, the surface area of the carrier increases to give proper resistance to the gas flow passage. Thereby, the contact period between the exhaust gas and the catalyst surface extends to allow a more sufficient catalytic reaction.

As for the producing method for obtain the wave shape on the wall surfaces of the cells of the monolithic catalyst carrier for purifying the exhaust gas, any methods can be taken as long as the wave shape is given to the wall surfaces of the cell, the surface area if the carrier increases, and as proper resistance is given to the gas flow passage. In particular, when the following producing method is used, a monolithic catalyst carrier for a gas, having a wave shape on the wall surfaces of the cells, is produced.

Fig.4 illustrates the abstract of a producing device for a monolithic catalyst carrier of the invention. The production process for the monolithic catalyst carrier is described hereinbelow based on Fig.4.

Sufficiently kneaded raw materials for the monolithic catalyst carrier, such as cordierite $2MgO{\cdot}2Al_2O_3{\cdot}5SiO_2$ and alumina titanate $Al_2O_3{\cdot}TiO_2$, are supplied in a raw material supply tank 2 and then transferred to an extruder 5. Next, a motor 4 is driven with a pressurizer 3 while a pressure is given to extrude the raw materials. Immediately

after the raw materials at a predetermined amount have been extruded into a monolithic shape passing a die 6, a holder 7 that holds an extruded carrier 1 is horizontally moved in the longitudinal direction (an extruding direction) of the carrier as indicated by an arrow 8 to add a stretch or a contraction to the carrier. The raw materials are then extruded at a predetermined amount again into a monolithic shape. While continuously repeating the two processes of the extruding and the stretching/contracting, a monolithic catalyst carrier at a necessary capacity is obtained. After passing a drying process at 100 or lower °C for about 1 hour and a sintering process at 1200 to 1300°C for 20 to 30 hours, the carrier is completed.

As in a second variant, a sufficiently kneaded raw material for the monolithic catalyst carrier, such as cordierite, is supplied in the tank 2 and the transferred to the extruder 5. The motor 4 is then driven with the pressurizer 3 while a pressure is given to extrude the raw material. A monolithic catalyst carrier at a predetermined amount is obtained passing the die 6. A drying process is applied at 100 or lower °C for about 1 hour while a stretch or a contraction is given during the drying. After passing a sintering process at 1200 to 1300°C for 20 to 30 hours, the carrier is completed.

As in a third variant, a sufficiently kneaded raw material for the monolithic catalyst carrier, such as cordierite, is supplied in the tank 2 and the transferred to the extruder 5. The motor 4 is then driven with the pressurizer 3 while a pressure is given to extrude the raw material. As shown in Fig.4 by reference number 9, a slight vibration is given to the die 6 or the holder 7 when the raw material is extruded into a monolithic shape passing the die 6 so as to obtain a monolithic catalyst carrier at a necessary

capacity. After passing a drying process at 100 or lower °C for about 1 hour and a sintering process at 1200 to 1300°C for 20 to 30 hours, the carrier is completed.

The level of the stretch, the contraction or the vibration as in the above producing method can be predetermined as needed as long as the cell structure is not destroyed.

In addition, the monolithic catalyst carrier carries noble metals such as Pt, Pd, Rh and the like by impregnating them in a gaseous phase reaction solution.

The monolithic catalyst carrier for purifying the exhaust gas of the invention and the producing method for the catalyst carrier are used for a variety of gaseous phase reactions, synthetic chemical and catalytic oxidation reactions using the gaseous phase reactions and exhaust gas purifying reactions. In particular, they are extremely effective if they are used for catalytic oxidation reactions for purifying exhaust gases of automobile vehicles.

[Advantageous Effect of the Invention]

The invention demonstrates the following advantages:

1. The catalytic area for a gas circulation within the monolithic catalyst is expanded without changing the entire capacity of the catalyst while the contact period between the exhaust gas and the contact surface is extended to sufficiently perform a catalytic reaction;

2. Because of the expanded catalytic surface, the period required for carrying a catalytic noble metal at an amount equivalent to that of prior art catalytic noble metal is reduced;

3. Because of improved performance due to the expanded catalytic surface, if only catalytic performance equivalent to that of prior art catalyst is required, the carried noble metal is reduced;

4. As the wave is added to the wall surface of the carrier cell, the mechanical strength improves.

[Working Example]

Cordierite at 500 g and alumina titanate at 500 g are sufficiently kneaded and supplied in a raw material supply tank and then transferred to an extruder. Next, a motor is driven with a pressurizer while a pressure at 5 Kg is given. Immediately after the raw materials at a predetermined amount have been extruded into a monolithic shape for 1 minute passing a die for extruding the raw materials, a holder that holds an extruded carrier is horizontally moved in the longitudinal direction (an extruding direction) of the carrier to add tensile stress or a contraction stress to the carrier. These stresses are added as long as the cell structure of the monolithic carrier is not destroyed while they are visually checked. The carrier is then extruded into a monolithic shape again for 1 minute.

By continuously repeating two processes of the extruding and the stretching-contracting, a monolithic catalyst carrier is obtained. After passing a drying process at 100 or lower °C for about 1 hour and a sintering process at 1200 to 1300°C for 20 to 30 minutes, a cylindrical carrier whose outer appearance has a 100 mm diameter and whose length is 150 mm is obtained. By applying Pt, Pd, Rh and the like to the carrier, a catalyst is obtained.

As for a comparative example, a conventional monolithic catalyst carrier in which the stretching/contracting process is not added after the extruding process is separately obtained. The carrier is formed into a catalyst at conditions as similarly to those as described above.

When the catalytic efficiency for the resistance of the gas flow passage using the catalysts obtained at the working example and the comparative example, the result as shown in Table 1 is obtained.

Table 1

	Resistance of the gas flow passage	Eliminating performance in the exhaust gas
Working example of the invention	[Please refer to the original description]	
Comparative example		

4. Brief Description of the Invention

Fig.1 is a perspective view illustrating a partially cut monolithic catalyst carrier of the invention.

Fig.2 is a perspective view illustrating prior art monolithic catalyst carrier.

Fig.3 is a perspective view illustrating partially cut prior art monolithic catalyst.

Fig.4 is a schematic diagram illustrating a producing device for the monolithic catalyst carrier of the invention.

Description of the Reference Numbers

1...Monolithic catalyst carrier

11...Cell wall of the monolithic catalyst carrier

2...Raw material supply tank

3...Pressurizer

4...Motor

5...Extruder

6...Die

7...Holder

8...Direction for adding a tensile force or a contracting force

9...Direction for adding a slight vibration

FIG. 1

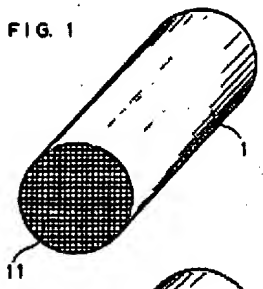


FIG. 2

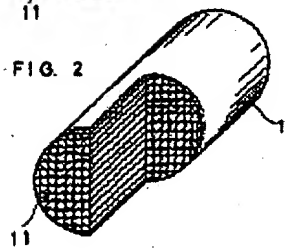


FIG. 3

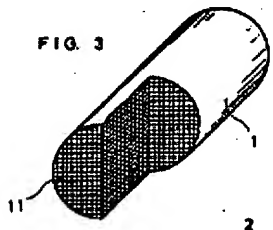
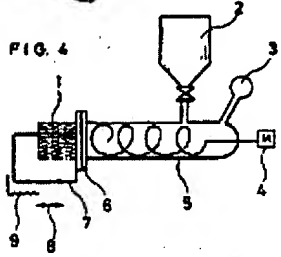


FIG. 4



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Chisato Morohashi